ON FOSSIL PLANTS FROM BELLEVUE, NEAR ESK.

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(Plates XV.-XXI.; Text-figures 1-3.)

Well-preserved specimens of fossil plants from Bellevue Station, a few miles easterly from Esk, on the Upper Brisbane River, were recently brought under the notice of the Queensland Museum by His Excellency the Governor of Queensland, Sir Matthew Nathan. The specimens were from among a collection made by Mrs. Lumley Hill, to whose enthusiasm in increasing this material the Museum owes a splendid series of fossil plants from this locality. From the variety of species represented and their apparent abundance, it seems certain that, with further systematic collecting, the horizon would rival that of Denmark Hill, Ipswich, as possibly the best-known locality for fossil plants in Queensland.

The collection itself is of more than ordinary interest, containing as it does a number of forms which have not previously been recorded from Mesozoic rocks in Queensland.

Since the last descriptions of fossil plants from the Esk district were published (Q'land Geol. Survey, Publications 252, 257, 259) two papers have appeared which deal more or less directly with the flora.

J. H. Reid, in a note on the Walloon Jurassic Flora (Proc. Roy. Soc. Qld., xxxiv., 1922 [1923], 168-170), would appear to record changes in the range and distribution of *Thinnfeldia* and *Tæniopteris*. The paper, however, seems merely to anticipate the correlation of the Esk Series with the Ipswich Series instead of with the Walloon Series, and to call attention to the modifications in the range of the species of these genera necessitated by this change. No new facts appear to be presented, and the distribution of these genera, as regards the Series in which they have been found, remains unaltered.

J. H. Reid and C. C. Morton (Geology of Country between Esk and Ipswich, Qland. Govt. Mining Journ., Jan. 1923, 7-14) propose the correlation of the Esk Series (comprising the Esk shales and Bellevue conglomerates) with the Ipswich Series, and also recognise the presence of an underlying series, the Borallon Series, outcropping between the Esk Series and the Brisbane Schist Series. The Esk and Ipswich Series are placed as Upper Triassic and the Borallon as Lower (?) Triassic. Provisional lists of the fossil plants are given, but as they are only, for the most part, generic determinations, they are of no value for detailed correlation. The evidence for placing the Borallon Series

so low in the Triassic appears to be the fact that there is "a well-marked unconformity," revealed by the strikes and dips, between the Borallon and Esk Series; at the same time it is stated that the fossils so far found by these authors are "also common to both the Ipswich and Esk Series."

The collection here described from the neighbourhood of Bellevue contains the following species:—*Neocalamites hoerensis*, *Schizoneura* cf. *africana*, *Schizoneura* sp. *a*, *Cladophlebis australis*, *C. lobifolia*, *Thinnfeldia Feistmanteli*, *T. lancifolia*, *Dictyophyllum rugosum*, *Pecopteris* (*? Asterotheca*) *Hillæ*, n. sp., *Tæniopteris* (*? Danæopsis*) *crassinervis*, *T. Carruthersi*, *T. Tenison-Woodsi*, *Sphenopteris superba*, *S. pecten*, *? Nilssonia superba*, n. sp., *Pterophyllum Nathani*, n. sp., *Pseudoctenis cathiensis*, *Podozamites lanceolatus*, *Ginkgoites digitata*, *G. sibirica*, *Ginkgoites* sp., *Baiera bidens*, *B. Simmondsi*, Gymnospermous seeds. *Phœnicopsis elongatus*.

The species which had previously been described from the Esk district are:—*Schizoneura* sp. *a*, *Cladophlebis australis*, *Dictyophyllum Davidi*, *Hausmannia Buchii*, *Thinnfeldia Feistmanteli*, *T. odontopteroides*, *T. lancifolia*, *Tæniopteris Tenison-Woodsi*, *T. Carruthersi*, *T. crassinervis*, *Stenopteris elongata*, *Ginkgo* cf. *magnifolia*, *Baiera Simmondsi*, *Pterophyllum abnorme*, *T. contiguum*, *T. Nathorsti*, *Pseudoctenis cathiensis*, *Otozamites Queenslandi*, *Taxites planus*, *Phœnicopsis elongatus*.

Of this latter list of twenty species, ten had also been found in the Ipswich Series, but eight of the others were confined to the Esk Beds and this, combined with the fact that very little field work had been done in the area, made it difficult to correlate the Esk beds with the Ipswich or Walloon Series with any degree of certainty. They were correlated with the Walloon Series mainly on the presence of coniferous types which were not known from the Ipswich Series.

As a result of further field work since 1918, by officers of the Queensland Geological Survey, the Esk Series have been correlated on stratigraphical grounds with the Ipswich Series. The evidence presented by the increased number of species of fossil plants confirms this proposed correlation. The additions to the fossil flora of the Esk district described here comprise *Neocalamites hoerensis*, *Schizoneura* cf. *africana*, *Cladophlebis lobifolia*, *Dictyophyllum rugosum*, *Pecopteris* (*? Asterotheca*) *Hillæ*, n. sp., *Sphenopteris superba*, *S. pecten*, (*? Nilssonia*) *superba*, n. sp., *Pterophyllum Nathani*, n. sp., *? Podozamites lanceolatus*, *Ginkgoites digitata*, *G. sibirica*, *Ginkgoites* sp., *Baiera bidens*, Gymnospermous seeds.

Of the thirteen determinable species in this list, three (*Pecopteris Hillæ*, *? Nilssonia superba*, and *Pterophyllum Nathani*) are new, three others (*Cladophlebis lobifolia*, *Sphenopteris pecten*, and *Ginkgoites sibirica*) are new to the Queensland fossil flora, and six others had previously only been described from the Ipswich Series.

Of the thirty-three determinable species now known from the Esk district, sixteen occur in the Ipswich Series.

Such species as *Pecopteris* (*? Asterotheca*) *Hillæ* and *Tæniopteris* (*? Danæopsis*) *crassinervis* point to a Rhætic age for the Esk Series, thus confirming the correlation of this Series with the Ipswich Series, for which a Rhætic age is indicated both by the fossil plants and insects.

It is not proposed to put forward here a critical analysis of the flora of the Esk Series, in view of the fact that the collections are still being added to (thanks to the enthusiasm of Mrs. Lumley Hill); also I have in hand for examination a series collected by Messrs. Reid and Morton in the district. Amongst these collections there are so far very few specimens from the Series which Reid and Morton have called the Borallon Series, and it is hoped that, before the whole flora is analysed, further specimens may be available for comparison with Lower Triassic floras.

EQUISETALES.

NEOCALAMITES HOERENSIS (Schimper).

(Plate XV., fig. 1.)

(*See* Q'land Geol. Surv., Pub. 252, 1915, p. 33, pl. 2, fig. 1.)

Specimen *F. 1485* is a good example of this species, which has previously been described from Denmark Hill, Ipswich (Walkom, 1915, p. 33).

The stem impression is 1·5 cm. wide, the nodes being about 3 cm. apart; in portion of the specimen the stem is coarsely ridged longitudinally, the ridges being about 1·5 mm. apart. The leaves are long and narrow (12 cm. long by 1·5-2 mm. wide) and are not very numerous.

One of the chief points of difference between this species and *N. Carrerei* is that in the latter the number of leaves in a whorl is considerably greater.

Locality.—Portion 32, Parish of Northbrook. (*F. 1485.*)

SCHIZONEURA cf. **AFRICANA** Feistm.

(Text-fig. 1.)

(*See* Q'land Geol. Surv., Pub. 252, 1915, p. 35, Pl. 3, fig. 1.)

In 1915 I referred a specimen from the Ipswich Series at Ebbw Vale to this species. In the present collection there are specimens which confirm my previous determination.

The stem is about 1·5 cm. in diameter, jointed, with the leaves in whorls at the nodes. There are about 5 leaves in a whorl, each nearly 1 cm. wide and more than 7 cm. long, traversed by 3-5 parallel veins. The leaf

becomes split along these veins, and gives the appearance of several very long thin leaves. The leaves are preserved along the bedding planes of the rock, the stem being perpendicular to the bedding.

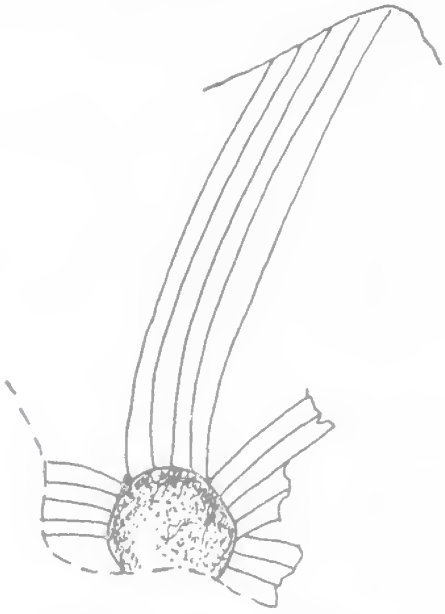

Fig. 1.—*Schizoneura* cf. *africana* Feistmantel.

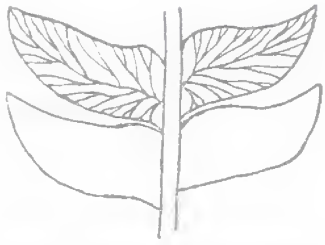

Fig. 2.—*Cladophlebis lobifolia* (Phillips). (× 2)

The specimens show very close similarity to that figured by Seward (1908, p. 89) from the Beaufort Series of South Africa, assigned to a Permian horizon.

Locality.—Portion 74, Parish Wivenhoe. (*F. 1539.*)

SCHIZONEURA sp. *a* Seward.

(Plate XVI.)

(*See* Q'land Geol. Surv., Pub. 252, 1915, p. 36.)

Pith casts of Equisetaceous stems appear to be abundant on the horizon from which these fossils were obtained. They are of a type similar to those described as *Schizoneura* sp. *a* from South Africa (Seward, 1908, p. 86) and Queensland (Walkom, 1915, p. 36).

The stems are in some cases more than ·75 m. (2 ft. 6 in.) long, 5 cm. wide, with internodes 8-9 cm. long. They are finely ridged, with about 17 ridges per cm. of breadth.

One specimen (*F. 1487a*) shows the basal end of a branch about 5 cm. in diameter.

Associated with some of these stems are what appear to be broad linear leaves, up to 2·5 cm. wide, traversed by few (up to 6) parallel veins, between which are fine parallel striations. Some of these leaves are so distributed that they appear to have their origin at the nodes of the stems, and should further specimens show this to be the case the reference of the pith casts to the genus *Schizoneura* will receive confirmation.

Localities.—Portions 74 (*F. 1533*—Plate XVI.) and 42, Parish of Wivenhoe (*F. 1554*).

FILICALES. OSMUNDACEÆ (?)

CLADOPHLEBIS AUSTRALIS (Morris).

(Plate XVII., fig. 1, E.)

(*See* Q'land Geol. Surv., Pub. 257, 1917, p. 3.)

Large fronds of this very common Mesozoic species are present in the collection. They do not differ from typical examples previously described and figured from the Ipswich and Walloon Series.

Locality.—Portion 32, Parish of Northbrook (*F. 1542*).

CLADOPHLEBIS LOBIFOLIA (Phillips).

(Plate XV., Fig. 2; Text-fig. 2.)

(For full synonymy *see* Seward, 1900, p. 145.)

Specimens from Bellevue differ from any species of *Cladophlebis* previously described from Queensland and correspond closely with figured examples of *C. lobifolia* from other parts of the world.

The frond is bipinnate, the pinnæ being long, linear, narrow, opposite or alternate; the pinnules are short, closely set, obtusely pointed, subopposite, generally with a lobe on the upper margin near the base. The venation is alethopteroid.

Localities.—Portion 24, Parish of Esk (*F. 1544*); Portion 42, Parish of Wivenhoe (*F. 1473*).

THINNFELDIEÆ.

THINNFELDIA FEISTMANTELI Johnston.

(Plate XVII., fig. 1, F.)

Good examples of this common species are in the collections from Bellevue. The species has been recorded in Queensland from the Ipswich Series in the Ipswich district, and from Kilcoy Range and 5 miles north of Esk. It has a wide distribution outside Queensland in rocks of Lower Mesozoic age.

For full reference to the synonymy and a discussion of the species *see* Queensland Geological Survey Publication 257, p. 17.

A small fragment on specimen *F. 1472* shows the structure of the rachis previously noted (Walkom, 1917, p. 19).

Locality.—Portion 42, Parish Wivenhoe (*F. 1468*).

THINNFELDIA LANCIFOLIA (Morris).

(Plate XV., fig. 3.)

(*See* Q'land Geol. Surv., Pub. 257, 1917, p. 21, Pl. 3, 4, 7.)

Specimens belonging to this species from the Esk district are in general of a somewhat more robust type than those previously described from Queensland. They do not, however, differ from typical examples of the species.

One specimen (*F. 1583*) shows a certain amount of the cell structure (probably of the cuticle) preserved as a silicified film. Similar specimens to this have been under examination for some time past from the Queensland Geological Survey collections from the Ipswich Series at Denmark Hill.

Locality.—Portion 42, Parish Wivenhoe (*F. 1472*); Portion 24, Parish Esk (*F. 1546*).

DIPTERIDINÆ.

DICTYOPHYLLUM RUGOSUM L. & H.

(Plate XXI., fig. 1.)

(*See* Q'land Geol. Surv., Pub. 257, 1917, p. 9, Pl. 4, 6, 9.)

Specimen *F. 1468* shows portion of a frond with five pinnæ, and is the most complete example of a frond of this species yet recorded from Queensland. The pinnæ are 10 cm. or more in length and up to 2·5 cm. wide; they are deeply divided into segments in their distal portions.

Locality.—Portion 42, Parish Wivenhoe (*F. 1468*).

(?) MARATTIALES.

PECOPTERIS (? **ASTEROTHECA**) **HILLÆ**, n. sp.

(Plate XVII., figs. 1, 2, and 3.)

Frond bi- (? tri-) pinnate; ultimate pinnæ long, narrow, parallel-sided; pinnules not quite at right angles to rachis, to which they are attached by the whole base, margins parallel, apices bluntly rounded, base slightly expanded. Midrib distinct; secondary veins few, simple, almost at right angles to midrib.

Fertile pinnæ (Plate XVII., fig. 3; *B* enlarged) differ in shape from sterile (Plate XVII., fig. 2; *A* enlarged) only in the pinnules being somewhat narrower and more pointed.

Sori (or synangia) contiguous, ·5 to ·75 mm. in diameter, in a row parallel to the margin of the pinnule, and composed usually of 4 sporangia. Further details of structure of sori and sporangia not determinable.

Ultimate pinnæ are up to 4 cm. long and 6-10 mm. broad.

The pinnules are 1·5 to 2 mm. broad and up to 4·5 mm. long, and have from 5 to 7 simple veins from each side of the midrib. In the sterile specimens none of these secondary veins branch as described by Zeiller (1903, p. 26) in *P.* (*Asterotheca*) *Cottoni* from the Rhætic of Tonkin. In the fertile pinnules there are from 10 to 14 sori on each pinnule.

The present species shows closest resemblances to *Pecopteris* (*Ptychocarpus*) *unita* Brongn., a species common in the Upper Coal Measures of England, and to *Pecopteris* (*Asterotheca*) *Cottoni* Zeiller from the Rhætic of Tonkin. It is not as completely known as the former, from which it differs certainly in the number of sporangia in the synangia, and also in the pinnules being always, as far as known, separate, not confluent for part of their length. The venation is apparently similar to that of *P. unita* and the size of the pinnules is approximately the same.

Pecopteris (*Asterotheca*) *Cottoni* is a larger species than ours and differs from it in the venation, the secondary veins in the Tonkin species branching once and sometimes a second time. Fertile examples of these two species, apart from differences in size, are very similar to one another.

To which genus of those with the Pecopteris type of foliage the present specimens belong, it will not be possible to determine definitely until examples are found with the synangia in a better state of preservation. They show a considerable degree of resemblance both to *Ptychocarpus* and *Asterotheca*, being apparently somewhat closer to the latter, in which the sporangia in a synangium are usually less in number than in the former and are also less closely united to one another (Scott, 1908, p. 279).

Ptychocarpus has been found only in Carboniferous Coal Measures, while *Asterotheca*, also an Upper Palæozoic genus, persists "in the Triassic and even Rhætic beds" (Scott, 1908, p. 350). *Pecopteris* (*Asterotheca*) *Cottoni* Zeiller occurs in the Rhætic beds of Tonkin.

Zeiller (1903, p. 26) placed *Scolecopteris australis* Shirley (1898, p. 17, Pl. 12) as a synonym of his *Pecopteris Cottoni* from Tonkin. It appears, however, that Shirley's specimens were more probably fertile examples of the species *Cladophlebis australis* (*see* Walkom, 1917, p. 3), and there was certainly not sufficient evidence preserved to allow them to be referred to *Scolecopteris.*

Both *Ptychocarpus* and *Asterotheca*, the two genera to which our specimens show most resemblance, belong to the Marattiales and it seems reasonable to place *P. Hillæ* as a member of this group.

No specimens similar to those now described have been recorded from

Australian Mesozoic rocks, and this species is named in honour of Mrs. Lumley Hill, whose enthusiasm is responsible for the collection of this valuable fossil plant material from the neighbourhood of Bellevue.

Locality.—Portion 42, Parish Wivenhoe (*F. 1582*).

TÆNIOPTERIS (? **DANÆOPSIS**) **CRASSINERVIS** (Feistm.).

(Plate XVIII., figs. 1, 2, and 3.)

Several specimens from Bellevue appear to be fertile examples of this species. The venation is similar to that in examples from Wycarbah (Walkom, 1917, Plate 1) in which the veins do not branch as frequently as indicated in Etheridge's description of the species (1892, p. 376).

The Bellevue specimens show a frond 8 cm. or more in breadth, with obtusely rounded apex; there is a very prominent midrib up to 8 mm. broad, striated longitudinally and, where eroded, showing internal structure consisting of an irregular series of anastomosing transverse strands. (Plate XVIII., fig. 1).

A similar structure appears to be present in some of the Indian specimens of *Danæopsis Hughesi* from the South Rewah basin, figured by Feistmantel (1882, pp. 25-27, Plates 4, 18) who, however, merely refers to this as transverse wrinkling of the rachis.

The secondary veins are almost at right angles to the midrib and are about 1 mm. apart; they branch but rarely and there are indications that they form a marginal vein at the edge of the lamina.

These secondary veins are in some specimens joined by a series of short irregular cross connections. Their irregularity lies in the fact that they are not always continuous from one vein to the next, but in these cases only reach about halfway. The explanation of this is provided by one specimen, of which the greater part shows the upper surface of the leaf, but in parts this is broken away and shows the series of transverse connections mentioned (Plate XVIII., fig. 1). Between the coarse veins in this specimen there can be seen one, occasionally two, very much finer veins (Plate XVIII., fig. 1). It is suggested that the cross connections mark the junction lines between adjacent sporangia and that the sporangia were aggregated in linear sori, placed between the veins and consisting of two rows of sporangia, the fine veins between the normal coarse ones marking the line of junction between the two rows of sporangia. Possibly where there are two of these fine veins the sporangia were more crowded and there were three rows. The dimensions of the sporangia would have been about ·75 x ·5 mm. Apparently the whole of the under surface was covered with the contiguous sporangia.

Unfortunately no detailed structure of the sporangia is preserved and it can only be suggested that the above interpretation is the correct explanation of the structure.

Halle (1921, p. 1) has given a full discussion of the genus *Danæopsis* and described a new species, *D. fecunda*, from fertile specimens. His specimens were well preserved and enabled him to work out the detailed structure of the sporangia.

I suggest the probability of the Australian *Tæniopteris crassinervis* belonging to *Danæopsis*, whose relation to recent genera of Marattiaceous ferns, as pointed out by Halle, is by no means clear.

Although a number of species of *Tæniopteris* have been described from Australian Mesozoic rocks, and specimens are very abundant on certain horizons, no fertile examples have yet been recorded or figured. The present examples from Bellevue, therefore, mark an advance in our knowledge of this common genus among Mesozoic plants. Australian species have at times been referred to such genera as *Angiopteridium* and *Oleandridium*, but this reference has been based entirely on the form of the leaf and the venation. From time to time I have pointed out that, although no Australian examples of *Tæniopteris* had been found showing the fertile characters, the English species *T. vittata* had been assigned to the Cycadophyta by H. H. Thomas (1915) and I therefore suggested the possibility of the Australian species belonging to the Cycads. It would seem now that one species, *T. crassinervis*, can be reasonably believed to be a marattiaceous fern, and we must therefore bear in mind the probability of other of our species of *Tæniopteris* belonging to the ferns.

Sterile examples of *T. crassinervis* in the collection do not differ from previously described specimens. One example (*F. 1583*) is a rather abnormal leaf in that the lamina is different in breadth on the two sides of the midrib, and has a lobed margin (Plate XVIII., fig. 3).

Locality.—Portion 42, Parish Wivenhoe (*F. 1577*); Portion 24, Parish Esk (*F. 1583*).

TÆNIOPTERIS CARRUTHERSI Tenison-Woods.

(Text-fig. 3.)

(*See* Q'land Geol. Surv., Pub. 257, p. 34.)

A number of specimens are referred to this species. One of them (*F. 1486a*) shows venation nearer to that originally described for the species than any I have previously examined. In this the secondary veins make a very acute angle with the midrib, but maintain this direction only for a distance of about 1 mm., when they curve outwards, and for the rest of their course they are at right angles to the midrib (Text-fig. 3). The secondary veins branch at varying distances from the midrib; near the midrib there are about 24 per cm., while near the margin they are more numerous.

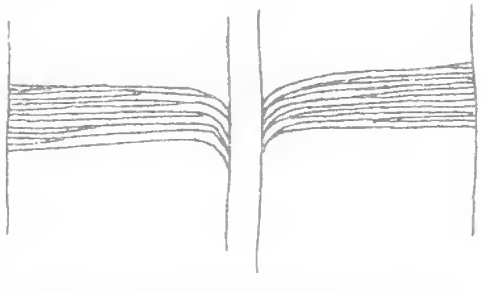

Fig. 3.—*Tæniopteris Carruthersi* Tenison-Woods. (× 2)

Locality.—Portion 32, Parish of Northbrook (*F. 1486a*).

TÆNIOPTERIS TENISON-WOODSI Etheridge Jr.

(*See* Q'land Geol. Surv., Pub. 257, p. 32.)

Several typical examples occur on a specimen from Portion 42, Parish Wivenhoe. They are narrow (6·5 to 8 mm. wide), strap-shaped, with acute apex, prominent midrib, and secondary veins making an acute angle with the midrib and branching occasionally.

Locality.—Portion 42, Parish Wivenhoe (*F. 1547*).

FILICALES INCERTÆ SEDIS.

? **SPHENOPTERIS PECTEN** Halle.

Some specimens bear a close general resemblance to *Sphenopteris pecten* described by Halle (1913, p. 35) from the Mesozoic flora of Graham Land. The frond is bi- (or tri-) pinnate, the pinnæ being alternate or opposite, narrow, elongate. The pinnules (or segments) are short (4 mm. long by 1·5–2 mm. wide), somewhat acute, and as far as can be seen each has a single vein. On account of the imperfect preservation I am not prepared to say whether the rachis is winged as in the specimens described by Halle. Our example may be compared with Halle's figures (1913, Pl. 4, figs. 21, 21*a*). They also show a resemblance to *Scleropteris crassa* Halle, also from Graham Land (cf. Halle, 1913, Pl. 4. fig. 5) but in this species the venation is different.

No specimens at all resembling the one under consideration here have been recorded previously from Queensland Mesozoic rocks.

Locality.—Portion 24, Parish Esk (*F. 1580*).

(?) **SPHENOPTERIS SUPERBA** Shirley.

Specimen *F. 1551* resembles in general appearance this species from the Ipswich Series (Shirley, 1898, p. 18; Walkom, 1917, p. 27). The specimen is imperfect and does not show the venation. It may also be compared with specimens described as *Callipteridium stormbergense* by Seward (1903, p. 58) from the Stormberg Beds of South Africa, and others described by Halle (1913, t. 4, fig. 5) as *Scleropteris crassa* from Graham Land.

Locality.—Portion 42, Parish Wivenhoe (*F. 1551*).

CYCADOPHYTA.

(? **NILSSONIA**) **SUPERBA,** n. sp.

(Plate XIX., fig. 1.)

Portions of some very large leaves are referred to a new species, placed doubtfully for the present in the genus *Nilssonia*. From the literature available to me it seems quite possible that the specimens represent a new genus, but, as none of them is complete, I hesitate to describe them as such. They seem

to be nearest to *Nilssonia* amongst the known Mesozoic genera, but there is a possibility also that they may represent a large species of *Tæniopteris*, such as *T. lata* from the Rajmahal Series in the Rajmahal Hills of India.

The leaves are large (length ?, breadth 24 cm. or more; in one specimen the length (incomplete) of a portion which is 13 cm. broad, is just over 13 cm.). The lamina is entire, traversed by numerous, simple, parallel veins (about 12 per cm.) almost at right angles to the rachis. In addition the lamina is coarsely wrinkled parallel to the veins, the wrinkles being most pronounced near the rachis and dying out before the margin is reached. As a result of the presence of these coarse wrinkles, the frond appears, on a casual glance, to be one of the Cycads such as *Zamites*, but closer examination leaves no doubt that the lamina is entire.

It is unfortunate that no complete examples have been found.

Locality.—Portion 42, Parish Wivenhoe (*F. 1463*).

PTEROPHYLLUM NATHANI, n. sp.

(Plate XX., figs. 1 and 2.)

Frond large; pinnæ long, narrow (to 5 cm. long, 5 mm. wide), parallel-sided, contiguous or distant, with bluntly pointed tips, slightly expanded at base; rachis prominent, 4-5 mm. wide, more or less wrinkled longitudinally; veins fine, 4-5 per mm., parallel, only occasionally branching.

The largest specimen is portion of a frond, 15 cm. long, the complete frond apparently being considerably longer.

Two specimens (*F. 1479* and *F. 1480*) are referred to this species, the only difference between them being that in *1479* the bases of the pinnæ are up to 4 mm. apart, whereas in *1480* they are contiguous. In the latter specimen the pinnæ became curled up before fossilisation, and as a result they appear to taper gradually to an acute point. (Plate XX., fig. 1.)

The determination and definition of many species of *Pterophyllum* are not easy, but the present specimens differ from species that have previously been described from Queensland in the proportions of the pinnæ (relative length and breadth) and in the fineness of the venation; whether they are conspecific with any of the species described from other parts of the world is difficult to determine without the opportunity of comparison with type material.

Pterophyllum Nathani may be compared with such species as *P. Jægeri* Brongniart from the Keuper of Stuttgart (cf. Seward, 1917, p. 553, fig. 610), with the description of which it agrees closely, except that the ends of the pinnæ are more rounded in *P. Jægeri*.

Other similar species are *P. æquale* recorded by Nathorst from the Rhætic of Scania, and by Zeiller from the Rhætic of Tonkin; *P. Braunianum*,

another Rhætic form, in which the pinnæ are narrower than in our specimens; and *P. Tietzei* from the Rhætic of Persia and Tonkin. A somewhat similar species occurs in the Burghersdorp Beds of Triassic age, in South Africa (Seward, 1908, p. 103).

Another species to which the present one shows some resemblance is *P. Kingianum* from the Jurassic (Liassic) flora of the Rajmahal Group (Feistmantel, 1877, Pl. 3, fig. 1 and Pl. 4, fig. 1).

The species is named in honour of Sir Matthew Nathan, Governor of Queensland, whose interest in the Queensland Museum was largely responsible for bringing this collection of fossil plants to that Institution.

Locality.—Portion 42, Parish Wivenhoe (*F. 1479*, *F. 1480*).

PSEUDOCTENIS EATHIENSIS (Richards).

(Plate XIX., fig. 2.)

(*See* Q'land Geol. Surv., Pub. 259, 1917, p. 19, Pl. 7.)

Further specimens, similar to those already recorded from several localities in the Esk district (Walkom, 1917*a*, p. 19), are in the Bellevue collection.

Locality.—Portion 24, Parish Esk (*F. 1486*); Portion 42, Parish Wivenhoe (*F. 1471*).

PODOZAMITES LANCEOLATUS (?) (Lindley and Hutton).

(Plate XXI., fig. 3–A.)

A few small lanceolate leaves, 2·5–3 cm. in length and 4 mm. wide, possibly belong to this species. Very similar isolated examples have been figured from India by Feistmantel (1877*a*, Plate IV.).

Locality.—Portion 42, Parish Wivenhoe (*F. 1469*).

GINKGOALES.

GINKGOITES SIBIRICA ? Heer.

(Plate XXI., fig. 4.)

(*See* Seward, Fossil Plants, Vol. IV., 1919, p. 24.)

The generic name *Ginkgoites* has been proposed by Seward (1919, p. 11) for fossil leaves that "it is believed belong either to plants generically identical with *Ginkgo* or to very closely allied types."

Specimen *F. 1553* may be referred to *G. sibirica*, first described by Heer from plant beds near Irkutsk in Siberia. This specimen agrees very

closely with a figure (Seward 1919, fig. 635*e*) reproduced after Heer's figure of the species. The species, as is the case with most species of *Ginkgoites*, shows considerable variation in the leaf form, and Seward (1919, p. 24) has suggested the retention of the name for "leaves similar to some of the more deeply divided forms of *G. digitata* and to *G. pluripartita*, but normally characterised by a lamina divided almost or quite to the base into oblong, obtuse or more or less acute segments."

The present example is a little over 5 cm. from base to outer margin; it is, near the base, divided into four segments, each about 1 cm. wide, and each of these segments is again divided twice. The veins divide frequently and there are about 18-20 per cm.

The specimen differs from any of those so far found in Queensland. It has not been considered advisable to suggest a new specific name for this example, in view of the wide distribution of certain types of *Ginkgo* leaf and the already long list of species described for this genus. *Ginkgoites sibirica* is mainly a Jurassic type.

The species *Baiera moltenensis* from the Molteno beds, of Rhætic age, in South Africa (Seward, 1908, p. 99) is somewhat similar to this Queensland specimen.

Locality.—Portion 24, Parish Esk (*F. 1553.*)

GINKGOITES DIGITATA (Brongniart).

(*See* Q'land Geol. Survey, Pub. 259, 1917, p. 8, Pl. 1.)

A single specimen belongs to this species. The leaf is only divided for a short distance from the margin, the indentations in no place reaching more than halfway towards the base. There is a very distinct median indentation, reaching nearly halfway to base, and several subsidiary ones. The whole margin does not show in the specimen, being partly broken or covered by rock. The leaf measures 3 cm. from base to margin and has the usual venation.

Locality.— Portion 24, Parish Esk (*F. 1540*).

GINKGOITES sp.

(Plate XXI., fig. 3–B.)

An isolated leaf is doubtfully referred to *Ginkgoites*. It is somewhat wedge-shaped, 3 cm. in length, 17 mm. broad in the upper part and 4·5 mm. at the base; it is traversed by veins, diverging from the basal portion, about 1 mm. apart and branching dichotomously at intervals.

Locality.—Portion 42, Parish Wivenhoe (*F. 1469*).

BAIERA BIDENS Tenison-Woods.

(Plate XXI., fig. 2.)

(*See* Q'land Geol. Surv., Pub. 259, 1917, p. 11, Pl. 3.)

This species, which has previously been recorded from Denmark Hill (Ipswich) and Yeronga (Walkom, 1917*a*, p. 11) is present in the collection from Bellevue, the specimen figured (*F. 1470*) being a fine example showing the form of the leaf.

Locality.—Portion 42, Parish Wivenhoe (*F. 1470*); Portion 24, Parish Esk (*F. 1546*).

BAIERA SIMMONDSI (Shirley).

Specimen *F. 1488* is probably portion of a leaf belonging to this species. The complete leaf is more than 12·5 cm. from base to outer margin, and is deeply divided into a number of segments. These segments appear to be broader than in any examples of the species that have come under my notice.

The species has previously been described from Denmark Hill (Ipswich) and Coal Creek near Esk. (*See* Walkom, 1917*a*, p. 10.)

Locality.—Portion 24, Parish Esk (*F. 1488*).

PHŒNICOPSIS ELONGATUS (Morris).

Specimen *F. 1475* shows a cluster of long narrow leaves for which possibly the generic name *Desmiophyllum* would be more suitable than *Phœnicopsis*. They are 14 cm. or more long, 1·5 cm. broad, and taper gradually to the base; they are traversed by a number (about 20) of parallel veins.

Similar specimens have been described from beds near Esk (Walkom, 1917*a*, p. 27) but this example is more complete than any hitherto described from Australia. It shows four leaves with their bases close together, suggesting the habit of such species as *Phœnicopsis speciosa* from the Jurassic of Siberia (Seward, 1919, p. 72).

Similar incomplete leaves have been described by Nathorst from the Rhætic beds of Sweden.

On the same specimen a stem of *Neocalamites hoerensis* lies near the bases of the Phœnicopsis leaves.

Locality.—Portion 42, Parish Wivenhoe (*F. 1475*).

GYMNOSPERMOUS SEEDS.

(1.) Specimen *F. 1469* shows an indistinct impression (*C*), possibly a gymnospermous seed. Only the general shape can be made out, the seed being oval in outline, its dimensions being 3 cm. x 2·2 cm. (Plate XXI., fig. 3, C.)

Locality.—Portion 42, Parish Wivenhoe.

(2.) On specimen *F. 1582* there is an example (Plate XVII., fig. 1, D) similar to one figured from Denmark Hill (Ipswich) (Walkom, 1917*a*, p. 27, Pl. 8, fig. 7). Attention was previously drawn to the resemblance exhibited by this type to the female flowers of *Ginkgo* (cf. Seward and Gowan, 1900, Pl. 9, fig. 6).

Locality.—Portion 42, Parish Wivenhoe.

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Explanation of Plates XV.--XXI.

Unless otherwise stated, figures are natural size.

PLATE XV.

Fig. 1.—*Neocalamites hoerensis* (Schimper).

Fig. 2.—*Cladophlebis lobifolia* (Phillips). (Slightly reduced.)

Fig. 3.—*Thinnfeldia lancifolia* (Morris). (Slightly reduced.)

PLATE XVI.

Schizoneura sp. α. Fig. 1 (× ·4); Fig. 2 (× ·3).

PLATE XVII.

Fig. 1—A, B. *Pecopteris* (*Asterotheca*) *Hillœ* Walkom. (Slightly reduced.)
C. *Ginkgoites* sp.
D. Gymnospermous seed.
E. *Cladophlebis australis* (Morris).
F. *Thinnfeldia Feistmanteli* Johnston.

Fig. 2.—*Pecopteris* (*Asterotheca*) *Hillœ* Walkom. Sterile pinna. (× 2·5.)

Fig. 3.—*Pecopteris* (*Asterotheca*) *Hillœ* Walkom. Fertile pinna. (× 2·5.)

PLATE XVIII.

Fig. 1.—*Tœniopteris* (*? Danœopsis*) *crassinervis* (Feistm.). (× 2.)
About the middle of the figure and to the left of the midrib the finer veins between the coarse ones can be seen.

Fig. 2.—*Tœniopteris* (*? Danœopsis*) *crassinervis* (Feistm.).

Fig. 3.—*Tœniopteris crassinervis* (Feistm.).

PLATE XIX.

Fig. 1.—(*? Nilssonia*) *superba* Walkom. (× ·4.)

Fig. 2.—*Pseudoctenis eathiensis* (Richards). (× ·8.)

PLATE XX.

Figs. 1, 2.—*Pterophyllum Nathani* Walkom. (× ·75.)

PLATE XXI.

Fig. 1.—*Dictyophyllum rugosum* L. & H. (× ·9.)

Fig. 2.—*Baiera bidens* Tenison-Woods. (× ·8.)

Fig. 3.—A. *Podozamites lanceolatus ?* (L. & H). (× ·7.)
B. *Ginkgoites* sp.
C. Gymnospermous seed.

Fig. 4.—*Ginkgoites sibirica ?* Heer.